ENERGY COMPLIANCE LLC

2302 NIGHTHAWK DRIVE
LARAMIE, WY 82072
307/721-8951
FAX - 307/721-8958

November 3, 2013

Kevin Frederick
Program Supervisor
Groundwater Pollution Control Program
Wyoming Department of Environmental Quality
Water Quality Division
Herschler Building, 4-W
122 West 25th Street
Cheyenne, WY 82002

RE: WOGCC/WDEQ Pavillion Area Pits and Groundwater Study

Dear Kevin:

This letter is to follow-up on our recent telephone discussion concerning my interest in providing professional services as an expert on oil and gas pits and groundwater resources in the Pavillion area to the WOGCC/WDEQ. As we discussed, I have been following the issues at Pavillion from the beginning. I performed some of the early investigations, collected some of the early samples, and provided some of the early testimony related to the concerns that private wells had been impacted by oil and gas operations.

I have over 20 years of experience investigating and remediating contaminated groundwater associated with unlined oil and gas pits (primarily pits that received natural gas condensate) in the Pavillion area and throughout Wyoming. In addition; I am very familiar with the groundwater resources of the Wind River Basin and throughout Wyoming from personal experience and through my work with the Wyoming State Geological Survey, The USGS, and the Wyoming Water Development Commission as a primary author on the recently finalized ***Available Groundwater Determination for the Wind River and Bighorn basins***; and the draft ***Available Groundwater Determination for the Platte River Basin*** that was recently made available online for public review:
(http://waterplan.state.wy.us/plan/bighorn/2010/finalrept/gw_toc.html)
(http://wwdc.state.wy.us/planning_program/20131002_Draft_PlatteRB_GW_Update.pdf).

I have over 35 years of experience as a professional geologist, mostly in Wyoming. For the past 24 years I have worked as a consultant providing a wide variety of environmental services, to industrial and commercial clients (primarily oil and gas companies), including (but not limited to): geologic and hydrogeologic investigations, environmental site characterization and assessment, abandoned mine lands studies, and ground-water exploration. I have designed, installed, and operated soil and groundwater remedial systems; and provided oil/gas, oilfield services, mining, municipal, and industrial clients with State and Federal permit maintenance and compliance services.

Recent and ongoing relevant projects include:

- Subsurface hydrogeologic investigation, assessment, and remedial options evaluation for oil and gas clients, and as a contractor to the WDEQ;

- Development and management of groundwater monitoring programs for evaluating the natural attenuation of petroleum hydrocarbon contaminants, primarily those associated with natural gas condensate;
- Excavation and evaluation of unlined condensate pits, and remediation to WDEQ standards of 1,000 to 60,000 cy of soil contaminated with natural gas condensate;
- Preparation and submittal of numerous applications to the WDEQ Voluntary Remediation Program (VRP) for investigation and remediation of unlined produced water, condensate retention, and other types of pits;
- Evaluation of environmental issues and due-diligence investigations associated with the sale and purchase of oil and gas production, gathering, compression, and processing facilities;
- Qualitative and quantitative health-based risk assessments;
- Contract technical editor for the Wyoming State Geological Survey.

Based on my work on old, unlined natural gas condensate pits, primarily in the Wind River Basin, I have developed conceptual models that inform my understanding of how free product (separate-phase) and dissolved-phase contaminants migrate, attenuate, and finally degrade in shallow unconfined and semi-confined aquifers. There are aspects of these processes that are similar between all of the sites I have investigated that should apply to deeper point-source releases (e.g., from faulty well casing) or from more widespread sources (e.g., from an oil/gas reservoir per induced fractures or natural seepage) - for example:

- The extent of contamination is strongly dependent on the volume of free product released to the subsurface.
- The extent of contamination from pits with only an aqueous-phase source (e.g., produced water) appears to be much less than pits that received free product.
- While free product appears to migrate readily through unsaturated lithologies in the vadose zone, the migration of free product through water-saturated lithologies is strongly retarded to the extent that it is essentially precluded.
- Aqueous-phase contamination from free product occurs from dissolution at the interface between free product and groundwater.
- The migration of aqueous-phase petroleum hydrocarbon contamination is strongly retarded in the Quaternary and Tertiary aquifers in Wyoming, even when a large volume of source material is released to the subsurface.

I believe that my experience with condensate pits and the groundwater resources of the Pavillion area would be directly applicable to the WOGCC/WDEQ studies of pits, oil and gas wells, and domestic wells.

Thank you for your time and consideration for these projects. Please let me know what I need to do to be considered.

Sincerely,

Paul Taucher WY P.G.58
Owner / Principal Hydrogeologist

CC: Grant Black (WOGCC)
Deborah Harris (WDEQ/WQD)
Vickie Meredith (WDEQ/SHWD)

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